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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/618,602	07/15/2003	Naoki Matsumoto	010986.52602US	5343

23911 7590 11/21/2008

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EXAMINER	
ALEJANDRO MULERO, LUZ L	
ART UNIT	PAPER NUMBER
1792	
MAIL DATE	DELIVERY MODE
11/21/2008	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/618,602	MATSUMOTO ET AL.	
	Examiner	Art Unit	
	Luz L. Alejandro	1792	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *07 November 2008*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-13 and 16-26* is/are pending in the application.

4a) Of the above claim(s) *1-12,18,20 and 24* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *13, 16-17, 19, 21-23, 25-26* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Applicant's request for reconsideration of the finality of the rejection of the last Office action is persuasive and, therefore, the finality of that action is withdrawn.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

Claims 13, 16, 23 and 25-26 are rejected under 35 U.S.C. 103(a) as being unpatentable over Miyake et al., JP 2001-35697 in view of Baldwin, Jr. et al., U.S. Patent 6,280,563, and Ueda et al., US 2003/0183169. Note that US 7,098,599 is an English equivalent of JP 2001-35697.

Miyake et al. shows the invention as claimed including a plasma processing apparatus for supplying radio-frequency power into a process chamber 1 so as to generate plasma to thereby treat an object to be processed with the plasma; wherein the process chamber has a top plate 2 which is disposed opposite to the object to be processed through the medium of a region for generating the plasma; wherein a plurality of metal-based inductively coupled radio-frequency antennas 5/10/14/16/18 are disposed in the process chamber to provide linear lines, electric current flows in each of the antennas in one direction so that the directions of the respective electric currents in the plural antennas are the same, the induction electric fields due to the electric currents in the plural antennas are strengthened by each other on a basis of interactions therebetween; and the adjacent antennas are in parallel with each other on the same plane which is parallel to the object to be processed; wherein the process chamber has a first chamber wall and a second chamber wall opposed to the first chamber wall and wherein the plurality of antennas penetrate the first chamber wall into the inside of the process chamber and the second chamber wall; wherein the radio-frequency antennas disposed in the process chamber are covered with an insulating material 6 so that the radio-frequency antennas do not directly contact the plasma (see, for example, figs. 1, 3, 10, 12 and 13, and their descriptions).

Miyake et al. does not expressly disclose where the top plate comprises a metal or silicon based material. Baldwin, Jr. et al. discloses a top plate 44 with a potential applied which is made of a metal (see fig. 1 and its description). In view of this disclosure, it would have been obvious to one of ordinary skill in the art at the time the

invention was made to modify the apparatus of Miyake et al. so as to have the top plate composed of a metal because, as disclosed by Baldwin, Jr. et al., such a material is suitable for having RF potential applied.

Miyake et al. seems to disclose a distributor 8 to distribute the radio frequency power so that the radio-frequency power can be supplied into the process chamber from the plurality of antennas. Furthermore, Ueda et al. discloses wherein said radio-frequency power is distributed by a distributor (14,15) so that the radio-frequency power can be supplied into the process chamber from said plurality of antennas (see fig. 3 and its description). In view of this disclosure, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the apparatus of Miyake et al. modified by Baldwin, Jr. et al., so as to include the distributor of Ueda et al. because in such a way RF power can be effectively applied to the antennas without a need for separate RF supplies.

Concerning claim 16, it would have been obvious to one of ordinary skill in the art at the time the invention was made to determine through routine experimentation the optimum length of the antenna based upon a variety of factors including the desired area of the plasma distribution and such limitation would not lend patentability to the instant application absent a showing of unexpected results.

Regarding claim 23, note that the apparatus of Miyake et al. comprises a substrate electrode 4 for supporting the object to be processed in the process chamber, but the reference does not expressly disclose that a bias is applicable to the susceptor 4. Baldwin, Jr. et al. discloses susceptor 20 to which a bias 22 is applicable. Therefore,

in view of this disclosure, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the apparatus of Miyake et al. as to further comprise a bias applicable to the susceptor in order to attract charge particles towards the workpiece.

Concerning claim 25, note that in the apparatus of Miyake et al. modified by Baldwin, Jr. et al., and Ueda et al., the electric fields are capable of being strengthened by one another.

Claim 17 is rejected under 35 U.S.C. 103(a) as being unpatentable over Miyake et al., JP 2001-35697 in view of Baldwin, Jr. et al., U.S. Patent 6,280,563, and Ueda et al., US 2003/0183169, as applied to claims 13, 16, 23 and 25-26 above, and further in view of Holland et al., U.S. Patent 5,975,013 or Takagi et al., US 2004/0020432. Note that US 7,098,599 is an English equivalent of JP 2001-35697.

Miyake et al., Baldwin, Jr. et al., and Ueda et al. are applied as above but do not expressly disclose wherein the thickness or diameter of the radio frequency antenna disposed in the process chamber is changed along with the propagation direction of the radio frequency power. Holland et al. discloses varying the thickness or diameter of a radio frequency antenna (see fig. 11 and its description), as does Takagi et al. (see fig. 2 and its description). In view of these disclosures, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the apparatus of Miyake et al. modified by Baldwin, Jr. et al., and Ueda et al. so as to vary the thickness

and/or the diameter of the coil as claimed because in such a way a uniform plasma density can be achieved.

Claim 19 is rejected under 35 U.S.C. 103(a) as being unpatentable over Miyake et al., JP 2001-35697 in view of Baldwin, Jr. et al., U.S. Patent 6,280,563, and Ueda et al., US 2003/0183169, as applied to claims 13, 16, 23 and 25-26 above, and further in view of Glukhoy, US 2003/0168172. Note that US 7,098,599 is an English equivalent of JP 2001-35697.

Miyake et al., Baldwin, Jr. et al. and Ueda et al. are applied as above but do not expressly disclose wherein an insulating fluid is circulated between the antenna and the insulating material. Glukhoy discloses that the antenna disposed in the process chamber is covered with an insulating material 64 so that the radio-frequency antenna does not directly contact the plasma, wherein an insulating fluid is circulated between the antenna and the insulating material using tubes 82 (see paragraph 0035-0036). In view of this disclosure, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the apparatus of Miyake et al. modified by Baldwin, Jr. et al. and Ueda et al. in order to circulate an insulating fluid between the antenna and insulating material in order to control the temperature of the antenna to avoid damage/heating of the antenna.

Claims 21-22 are rejected under 35 U.S.C. 103(a) as being unpatentable over Miyake et al., JP 2001-35697 in view of Baldwin, Jr. et al., U.S. Patent 6,280,563, and

Ueda et al., US 2003/0183169, as applied to claims 13, 16, 23 and 25-26 above, and further in view of Grimbergen et al., U.S. Patent 6,390,019. Note that US 7,098,599 is an English equivalent of JP 2001-35697.

Miyake et al., Baldwin, Jr. et al., and Ueda et al. are applied as above, and Miyake et al. further discloses the use of a measuring device disposed at a side wall of the chamber (see, col. 7, lines 64-67), but do not expressly disclose wherein the measuring device is disposed in at least one position of the top plate so as to monitor the state of the generated plasma; also the references do not disclose that the top plate has a plurality of apertures for passing a gas to be supplied to the processing chamber. Grimbergen et al. discloses a measuring device 25 which is disposed in the top of the chamber so as to monitor the state of the generated plasma (see fig. 1 and its description), and a top plate which has a plurality of apertures for passing a gas to be supplied to the process chamber (see, for example, figs. 2 and 3a and their descriptions). In view of this disclosure, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the apparatus of Miyake et al. modified by Baldwin, Jr. et al., and Ueda et al. so as to have the measuring device and apertures as suggested by Grimbergen et al. because having the measuring device and apertures in the top plate allows for accurate measurements and uniform distribution of the gas across the workpiece.

Claims 13, 16, 19, 23, and 25-26 are rejected under 35 U.S.C. 103(a) as being unpatentable over Taguchi et al., U.S. Patent 6,469,448 in view of Baldwin, Jr. et al., U.S. Patent 6,280,563, Miyake et al., JP 2001-35697, Glukhoy, US 2003/0168172, and Ueda et al., US 2003/0183169. Note that US 7,098,599 is an English equivalent of JP 2001-35697.

Taguchi et al. shows the invention substantially as claimed including a plasma processing apparatus for supplying radio-frequency power into a process chamber so as to generate plasma, to thereby treat an object to be processed with the plasma; wherein the process chamber has a top which is disposed opposite to the object to be processed through the medium of a region for generating the plasma; wherein a plurality of metal-based radio-frequency antennas 9 are disposed in the process chamber, wherein the process chamber has a chamber wall having at least one antenna so that the antenna penetrates the chamber wall into the inside of the process chamber (see figs. 5 and 12 and their descriptions).

Taguchi et al. does not expressly disclose where the top plate comprises a metal or silicon based material. Baldwin, Jr. et al. discloses a top plate 44 with a potential applied which is made of a metal (see fig. 1 and its description). In view of this disclosure, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the apparatus of Taguchi et al. so as to have the top plate composed of a metal because, as disclosed by Baldwin, Jr. et al., such a material is suitable for having RF potential applied.

Taguchi and Baldwin, Jr. et al. are applied as above but do not expressly disclose wherein the antenna provides linear lines, electric current flows in each of the antenna in one direction so that the direction of electric currents in plural antennas are the same and induction electric fields due to the electric currents in the plural antennas are strengthened by each other on a basis of interactions therebetween. Miyake et al. discloses wherein the antenna provides linear lines (5/10/14/16/18) so that the direction of electric currents in plural antennas are the same, induction electric fields due to the electric currents in the plural antennas are strengthened by each other on a basis of interactions therebetween and the adjacent antennas are in parallel with each other on the same plane which is parallel to the object to be processed (see, for example, figs. 1, 3, 10, 12 and 13, and their descriptions). In view of this disclosure, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the apparatus of Taguchi et al. modified by Baldwin, Jr. et al. so as to include the claimed antenna configuration as disclosed by Miyake et al. because using such an antenna arrangement a more uniform plasma over a wider area is possible and/or a stable, large-diameter, large-volume, high-density plasma is generated. Furthermore, note that Miyake et al. discloses covering the antennas with an insulating material. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to cover the antenna with an insulating material, and have an antenna penetrating opposing sidewalls because such a structure will protect the antenna.

Taguchi et al., Baldwin, Jr. et al., and Miyake et al. are applied as above but do not expressly disclose wherein an insulating fluid is circulated between the antenna and the insulating material, and wherein the process chamber has a second chamber wall opposed to the first chamber wall, and each antenna penetrates the first chamber wall and the second chamber wall. Glukhoy discloses that the antenna disposed in the process chamber is covered with an insulating material 64 so that the radio-frequency antenna does not directly contact the plasma, wherein an insulating fluid is circulated between the antenna and the insulating material using tubes 82 (see paragraph 0035-0036), and wherein the process chamber has a second chamber wall opposed to the first chamber wall, and each antenna penetrates the first chamber wall and the second chamber wall. In view of this disclosure, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the apparatus of Taguchi et al. modified by Baldwin, Jr. et al. and Miyake et al. in order circulate an insulating fluid between the antenna and insulating material, and have an antenna penetrating opposing sidewalls in order to control the temperature of the antenna to avoid damage and be suitable for generating an inductively coupled plasma.

Taguchi et al., Baldwin, Jr. et al., Miyake et al., and Glukhoy are applied as above but do not expressly disclose wherein said radio-frequency power is distributed by a distributor so that the radio-frequency power can be supplied into the process chamber from said plurality of antennas. Ueda et al. discloses wherein said radio-frequency power is distributed by a distributor (14,15) so that the radio-frequency power can be supplied into the process chamber from said plurality of antennas (see fig. 3 and

its description). In view of this disclosure, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the apparatus of Taguchi et al. modified by Baldwin, Jr. et al., Miyake et al., and Glukhoy so as to include the distributor of Ueda et al. because in such a way RF power can be effectively applied to the antennas without a need for separate RF supplies.

Concerning claim 16, it would have been obvious to one of ordinary skill in the art at the time the invention was made to determine through routine experimentation the optimum length of the antenna based upon a variety of factors including the desired area of the plasma distribution and such limitation would not lend patentability to the instant application absent a showing of unexpected results.

Regarding claim 23, note that the apparatus as shown in Taguchi et al. includes a susceptor 6 for supporting the object to be processed in the process chamber, and a bias 7 is applicable to the susceptor.

Concerning claim 25, note that in the apparatus of Taguchi et al. modified by Baldwin, Jr. et al., Miyake et al., Glukhoy and Ueda et al., the electric fields are capable of being strengthened by one another.

Claim 17 is rejected under 35 U.S.C. 103(a) as being unpatentable over Taguchi et al., U.S. Patent 6,469,448 in view of Baldwin, Jr. et al., U.S. Patent 6,280,563, Miyake et al., JP 2001-35697, Glukhoy, US 2003/0168172, and Ueda et al., US 2003/0183169, as applied to claims 13, 16, 19, 23, and 25-26 above, and further in view

of Holland et al., U.S. Patent 5,975,013 or Takagi et al., US 2004/0020432. Note that US 7,098,599 is an English equivalent of JP 2001-35697.

Taguchi et al., Baldwin, Jr. et al., Miyake et al., Glukoy, and Ueda et al. are applied as above but do not expressly disclose wherein the thickness or diameter of the radio frequency antenna disposed in the process chamber is changed along with the propagation direction of the radio frequency power. Holland et al. discloses varying the thickness or diameter of a radio frequency antenna (see fig. 11 and its description), as does Takagi et al. (see fig. 2 and its description). In view of these disclosures, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the apparatus of Taguchi et al. modified by Baldwin, Jr. et al., Miyake et al., Glukhoy, and Ueda et al. so as to vary the thickness and/or the diameter of the coil as claimed because in such a way a uniform plasma density can be achieved.

Claims 21-22 are rejected under 35 U.S.C. 103(a) as being unpatentable over Taguchi et al., U.S. Patent 6,469,448 in view of Baldwin, Jr. et al., U.S. Patent 6,280,563, Miyake et al., JP 2001-35697, Glukhoy, US 2003/0168172 and Ueda et al., US 2003/0183169, as applied to claims 13, 16, 19, 23, and 25-26 above, and further in view of Grimbergen et al., U.S. Patent 6,390,019. Note that US 7,098,599 is an English equivalent of JP 2001-35697.

Taguchi et al., Baldwin, Jr. et al., Miyake et al., Glukhoy, and Ueda et al. are applied as above but do not expressly disclose wherein a measuring device is disposed in at least one position of the top plate so as to monitor the state of the generated

plasma and the top plate has a plurality of apertures for passing a gas to be supplied to the processing chamber. Grimbergen et al. discloses a measuring device 25 which is disposed in the top of the chamber so as to monitor the state of the generated plasma (see fig. 1 and its description), and a top plate which has a plurality of apertures for passing a gas to be supplied to the process chamber (see, for example, figs. 2 and 3a and their descriptions). In view of this disclosure, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the apparatus of Taguchi et al. modified by Baldwin, Jr. et al., Miyake et al., Glukhoy, and Ueda et al. so as to have the measuring device and apertures as suggested by Grimbergen et al. because having the measuring device and apertures in the top plate allows for accurate measurements and uniform distribution of the gas across the workpiece.

Response to Arguments

Applicant's arguments with respect to claims 13, 16-17, 19, 21-23, and 25-26 have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Luz L. Alejandro whose telephone number is 571-272-1430. The examiner can normally be reached on Monday to Thursday from 7:30 to 6:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Parviz Hassanzadeh can be reached on 571-272-1435. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Luz L. Alejandro/
Primary Examiner, Art Unit 1792

November 19, 2008